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ABSTRACT

Oral reading samples were gathered from a group of twenty normal boys from the fourth through sixth grades. All reading errors were coded and classified using a modified version of the taxonomies of Goodman and Burke. Through cluster analysis two distinct error patterns were found. One group consisted of students whose performance was limited mainly by their ability to decode the printed symbols into a usable internal code, while the other group was limited more by cognitive factors centering on their inability to understand what they read. The information-limited boys were found to have an oral reading grade level over two years advanced beyond that expected from silent reading tests and from their verbal IQ, while the decoding-limited boys were average in all three areas. Information-limited boys made more effective use of graphic and phonic cues while reading but were much less likely to conserve semantic information when they made reading errors. No consistent differences were found in the use of syntactic cues. (Author)

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Oral Reading Errors of Average and Superior Reading Ability Children[1]

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Abstract

Oral reading samples were gathered from a group of twenty normal boys from the fourth to sixth grades. All reading errors were coded and classified using a modified version of the taxonomies of Goodman & Burke. Through cluster analysis two distinct error patterns were found. One group consisted of children whose performance was limited mainly by their ability to decode the printed symbols into a usable internal code, while the other group was limited more by cognitive factors centering about their inability to understand what they read.

The information-limited boys were found to have an oral reading grade level over two years advanced beyond that expected from silent reading tests and from their verbal IQ, while the decoding-limited boys were average in all three areas. Information-limited boys made more effective use of graphic and phonic cues while reading, but were much less likely to conserve semantic information when they made reading errors. No consistant differences were found in the use of syntactic cues.

Oral Reading Errors of Average and Superior Reading Ability Children

When a child is asked to read a story, his ability to comprehend that story is limited by two factors. The first limit to reading performance is a child's restricted ability to translate the printed symbols into some form of internal representation. This "decoding" limit is typical of the reading problems of beginning readers and adults who are made to read perceptually distorted materials. In both cases the reader posesses adequate linguistic sophistication and general knowledge to understand the text, but is unable to do so because of problems in decoding the printed symbols into an analyzable internal structure.

A second limit in reading comprehension comes from restrictions in an individual's ability to understand that internal representation. This "information" limit represents a combination of three skill restrictions: finite vocabulary knowledge, limited linguistic performance capabilities, and inadequate cognitive skills necessary to properly combine the propositions contained within the text. This information limit is more typical of the reading problems of advanced readers, in that they posess sufficient decoding skills to be able to generate some form of internal representation of the text, but lack the ability to understand its contents.

Ample anectdotal evidence exists to suggest the reality

of this second limit to reading performance. Most adults have at one time or other suffered through the task of having to read a particularly turgid text. Even though one has the subjective experience of having "read" the text, one is often almost totally unable to recall the story. What happens in such circumstances is that one has the ability to decode the story and hence has the sensation of "reading it," but due to the complexity of the text one is unable to extract usable information from it.

Although the existance of these two limits is intuitively quite obvious, there is surprisingly little research which attempts to clearly map out the differing roles of these two limits. Part of this absence is due to the fact that until recently researchers have lacked techniques to directly observe reading behavior without totally confounding it with memory of other cognitive processes. Recent work involving the psycholinguistic analysis of oral reading errors (c.f. Weber, 1968) has shown that through the detailed comparison of errors with the text one can obtain considerable insight into the strategies used by children when they read.

This technique is based on the assumption that reading errors are not simply random occurences but are examples of inaccurate or incomplete usage of the available textual information. By detailed comparison of the error to the text one can discover what types of textual information or cues are normally conserved or violated when errors occur. From these error patterns one can infer how reading strategies vary both

between individuals and between various types of reading materials.

This approach to the study of reading suggests that if there do exist two different limits to reading comprehension, they should be manifested by two distinctly different patterns of oral reading errors, since oral reading involves "understanding" factors as well as "decoding" factors.

Subjects

The children in this study consisted of 20 boys from the fourth, fifth and sixth grades of a local urban parochial school. The group had been selected to be similar in age and IQ to a group of reading disabled children who had participated in an earlier experiment (Geoffrion, 1973). All children in this study were making normal progress, had never skipped or repeated any grades and had never required remedial reading instruction.

Each child was individually administered the Peabody Picture Vocabulary Test (PPVT) and the Gray Oral Reading Test (GORT) to determine his verbal IQ and oral reading ability.

Materials

Six passages were selected to represent the broad range in oral reading skills revealed by the scores on the Gray Oral reading Test. The passages were chosen to be comparable in style and difficulty to those found in the Gray Oral. The passages and their characteristics are summarized in Table 1.

Procedure

Each child read only one story. The difficulty level of the story given each child was determined by examination of his Gray Oral Reading Test passage scores. The story read by the child was of about the same difficulty level as the first passage in which the child received a zero scaled score. In this way it was hoped to keep task difficulty comparable between individuals.

Each child was asked to read the story aloud and to pay attention to what he read. He was also told that he would receive no aid while reading it. The child's reading of the story was tape recorded without interruption by the experimenter.

The experimenter later played back the tapes noting all deviations from the printed text. Whenever such deviations or errors occurred, each one was coded and classified using a taxonomy adapted from those of Y. Goodman & Burke (1972) and K. Goodman & Burke (1968). The details of this taxonomy will be presented as they become relevant to the discussion of results.

Results

Since it is not obvious a priori what factors might characterize subjects who are information limited rather than decoding limited, subjects' overall error patterns were subjected to cluster analysis using Johnson's hierarchical clustering program (Johnson, 1967). Clustering was done using

both the connectedness and diameter methods for calculating cluster membership with both methods producing identical results. The characteristics of children in the two clusters are summarized in table 2. The first cluster ("superior readers") consist of boys whose oral reading ability is considerably superior to their silent reading ability. These boys read mainly the most advanced reading samples.

The second cluster ("average readers") are boys whose silent and oral reading abilities are both about average for their age. Both groups are about same however in chronological age, IQ, and silent reading ability.

The scores for the two groups in each coding category will be presented next. All differences were tested using the t-test for uncorrelated means. The means along with related t-values are summarized in table 3.

Reading Speed: Reading speed was determined by dividing the total length of the reading sample by the total time required to read it. There was no significant difference between groups with both groups reading at about 95 words per minute.

Total Error Rate: All deviations from the printed text, other than partial pronunciation attempts, were considered as errors. Once again there was no significant difference between groups. Since reading speed and error rate are generally accepted indices of task difficulty, the results in these two categories suggest that although the two groups read different material, the subjective difficulty

of the task remained comparable between groups.

Type of Error I: All errors were subdivided into three major types. The first type were simple regressions where the subject repeated one or more words without any overt error in either reading. In all other instances, the first occurrence of an error was coded and all future instances of that error were classified as repeated errors. Only coded errors were subjected to detailed analysis in further stages of the taxonomy. This was done to prevent any potential bias in the observed patterns arising from a child's ignorance of a particularly common word in a story.

Superior readers made fewer simple regressions than the average readers, but did not differ significantly in other categories. One interpretation of simple regressions is that they represent "covert errors", that is, although the child read the word correctly, he was unsatisfied about its identity or role in the passage and therefore felt it necessary to recheck it. This difference between groups suggests than that superior readers either make fewer covert errors or, having committed them, they are less likely to correct them.

Type of Error II: All coded errors were subdivided into omissions, insertions, substitutions, and nonsense substitutions (the word or words spoken were not meaningful words). The error pattern for the average readers was similar to those made by beginning readers and adult subjects who try to read perceptually distorted material in that substitutions constitute the overwhelming majority or errors.(c.f. Weber, 1968).

The pattern for the superior readers was distinctly different with fewer meaningful substitutions and more nonsense substitutions than the other group.

Multiple Word Errors: If an error involved more than one word, either in the error itself or in any subsequent correction attempt, then that error was classified as a multiple word error. Superior readers made significantly fewer multiple word errors than the average readers.

Self-Correction: For each coded error it was noted whether or not the child spontaneously tried to correct himself and whether or not that correction attempt was successful. Superior readers were significantly less likely to spontaneously correct themselves and were less successful in their correction attempts. Since K. Goodman & Burke (1968) have shown that the probability of self correction is highly related to whether or not a child detects a contradiction between his response and the text, this difference suggests that the superior readers are less able to understand the story and therefore are more likely to miss errors when they occur.

Locus of Error: In substitution errors of single words, the error was classified as to whether or not it involved mainly the beginning only, middle only, end only, or involved more than one part of the word. The average readers made relatively few errors which involved only the beginning of a word with the error likelihood increasing monotonically toward the end of the word. This is the same pattern as found in children who are beginning readers (Shankweiler & Liberman,

1972). The error pattern of the superior readers is different from those beginning readers in that errors involving the middle of the word are the most common.

Similarity Indices: Using scales adapted from K. Goodman & Burke (1968) and Y. Goodman & Burke (1972), the graphic and phonic similarity of all substitution errors were measured using a zero-one-two scale. Superior readers made errors which were signifncantly more similar in both graphic and phonic dimensions. This suggests that superior readers are better able to utilize the orthographic and phonic regularity of the english language.

Syntactic Category: In all substitutian errors, the text word and the error were classified into five categories: nouns, verbs, adjectives, adverbs, and function words or other words. The superior readers were significantly more likely to conserve syntactic category when making errors. Superior readers were also less likely to make errors involving verbs and function words, but were more likely to make errors involving adverbs than were the average readers.

Linguistic Acceptability: Syntactic and Semantic acceptabiliby were estimated using a zero-one-two scale developed by Y. Goodman & Burke (1972). A syntactically acceptable error was one which produced a syntactically acceptable sentence regardless of whether or not that sentence was meaningful, while a semantically acceptable error was one which was not only syntactically acceptable but also produced a maaningful sentence, regardless of whether or

not its meaning was the same as that intended by the author. A third index "degree of meaning change" was used to assess the extent to which an error changed the meaning of the sentence from that intended by the author. There was no significant difference between groups in syntactic acceptability but the superior readers made errors which had much less semantic acceptability and which resulted in much greater loss of meaning.

Discussion

The superior readers represent a group of children whose reading performance is limited mainly by their ability to understand the text. This is supported by the following error characteristics:

1. Superior readers are much less likely to conserve semantic information. The low scores in both semantic acceptability and degree of meaning change suggest that the superior readers are losing much more of the content of the stories than are the average readers.

2. Superior readers are more likely to substitute nonsense utterances for words in the story. This shows that these children were unable to correctly identify much of the vocabulary employed in these stories.

3. Superior readers are both less likely to detect errors (self-correction attempts) and are less successful in correcting those which they detect.

The contention that the average readers represent a group of children who are still decoding limited is supported by the finding that in most categories where the two groups differ, the pattern demonstrated by the average readers more closely approximates the error patterns made by children who are beginning readers (Geoffrion, 1973). This trend is particularly evident in the "locus of error" and the "type of error" categories.

Another line of evidence which lends credence to this hypothesis comes from detailed examination of the Gray Oral Reading Test which was administered to each child. The score on this test is based exclusively upon reading speed and accuracy, but four comprehension questions are included after each paragraph even though they play no role in scoring the test. If one examines the last paragraph in which the child received a non-zero scaled score, then of the four comprehension questions, the average readers correctly answered an average of 2.8 questions while the superior readers could correctly answer only 0.8 questions. No norms are available on these questions and therefore one can not be certain they are equally hard for all paragraphs, but the results are most suggestive in view of the reading error patterns observed herein.

It is interesting to note that although the superior readers were much less effective in the use of semantic cues, their ability to effectively utilize graphic and phonic cues is clearly superior to the average readers. Results for the

use of syntactic cues are ambiguous suggesting only a slight tendancy favoring superior readers, that is, although the superior readers were more likely to conserve syntactic category there was no difference in syntactic acceptability between the groups. These findings agree well with the work of Coomber (1972) who found that better readers in a class of third graders differed mainly in their grapho-phonic skills rather than in their ability to utilize syntactic structures.

Does this experiment then show that superior readers are children who are unable to understand what they read? The gist of this experiment is that the superior readers represent a group of children whose decoding skills are so strong that when stressed sufficiently to cause frequent reading errors, these errors arise mainly from the child's inability to understand what he is reading. This implies that while children who were in the average group might benefit from a reading program which continues to emphasize word-attack skills, the superior readers would benefit more from a program which emphasized general language and cognitive development. In other words, this approach can provide an indicator of when a child no longer needs explicit instruction in reading and could be better served by devoting that time to other material.

Future research will need to focus on two major directions. The first is to validate the educational implications suggested above. The second major problem will be to develop accurate predictors of when a child shifts from one limit to the other. Because of the small sample size in this study it is not possible to accurately indicate the correlates of membership in

the information limited group. Most likely membership will be determined by comparison of a child's oral reading age with his mental age.

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Table 1.

Passages Used in this Study

Nominal Level	Source	Type of Story	Dale-Chall Grade Level[1]
Grade 4	Betts & Welch (1964)	Basal reader, fiction	4.5
Grade 5	ibid	Basal reader, fiction	5.0
Grade 6	ibid	Basal reader, fiction	5.7
Easy Adult	Weiner, 1953 (excerpt)	Autobiographical narrative	7.5
Moderate Adult	Murray, 1973 (excerpt)	Factual essay on space travel	11.
Difficult Adult	Ganong, 1969 (excerpt)	Textbook essay	13.

1. Dale & Chall (1948).

Table 2.

Characteristics of Reading Group Placement

Variable	Superior Readers	Average Readers	t[1]	Sig.
Age	10y10mo.	10y1mo.	1.96	n.s.
Verbal IQ[2]	109.0	108.1	0.11	n.s.
Menatal Age[2]	11y9mo.	10y11mo.	1.15	n.s.
Oral Reading[3]	7.79	4.78	4.10	p .001
Silent Reading[4]	5.89	4.88	1.50	n.s.
Number of Boys Reading Passage				
4	0	1		
5	0	2		
6	0	4		
7	1	1		
8	5	0		
9	5	1		
Total	11	9		

1. Two-tailed t-test for uncorrelated means.

2. Verbal IQ and Mental Age as measured by the Peabody Picture Vocabulary Test.

3. Oral Reading measured by Gray Oral Reading Test.

4. Silent reading measured by school-administered Iowa Test of Basic Skills.

Table 3.

Oral Reading Errors of Superior & Average Readers

Category	Superior Readers	Average Readers	t*	Sig.
Reading Speed (wds. per min.)	95.3	96.0	0.07	n.s.
Total Error Rate (per 100 words)	9.14	8.53	0.59	n.s.
Type of Error I				
Regressions (per 100 wds.)	0.73	1.41	2.67	.05
Repeated Errors (per 100 wds.)	1.75	1.14	1.50	n.s.
Coded Errors (per 100 wds.)	6.66	5.97	0.83	n.s.
Type of Error II				
Pct. Omissions	8.9	12.0	1.07	n.s.
Pct. Insertions	5.9	6.7	0.40	n.s.
Pct. Substitutions	46.3	71.1	5.16	.001
Pct. Nonsense Substitutions	38.9	10.3	5.46	.001
Pct. Multiple Word Errors	12.2	24.4	2.60	.02
Self Correction				
Pct. of Errors Where Correction is Attempted	19.0	32.5	3.15	.01
Success Rate of Correction Attempts	68.1	86.3	2.90	.02

Table 3. (Cont.)

Locus of Error				
Pct. Beginning of word only	15.2	9.2	2.41	.05
Pct. Middle of word only	32.9	15.1	4.97	.001
Pct. End of word only	25.1	31.9	2.06	n.s.
Pct. Multiple Parts of word	12.2	24.4	2.60	.02
Similarity Indices				
Graphic Similarity (0 to 2 scale)	1.37	1.00	5.03	.001
Phonic Similarity (0 to 2 scale)	1.25	0.93	4.51	.001
Syntactic Category				
Pct. of Errors where Category is Conserved	83.5	77.0	2.14	.05
Pct. Nouns	37.5	30.1	1.72	n.s.
Pct. Verbs	18.1	28.6	3.46	.01
Pct. Adjectives	27.0	22.4	1.54	n.s.
Pct. Adverbs	8.8	4.1	2.67	.02
Pct. Function Wds. or Other	7.9	14.8	2.91	.02
Linguistic Acceptability				
Syntactic Accept. (0 to 2 scale)	1.44	1.42	0.35	n.s.
Semantic Accept. (0 to 2 scale)	0.65	1.08	4.80	.001
Meaning Change (0 to 2 scale)	0.82	1.14	5.02	.001

* Uncorrelated t-test for unequal means.